

**CLAIMS:**

1. In an electronic device, a method comprising the steps of:  
grouping a first data signal of a first signal type and second data signal of a second signal type to form a bus signal in a graphical model displayed on a graphical user interface;  
and  
performing a non-virtual operation on the bus signal.
2. The method of claim 1, wherein the graphical model is a block diagram, and the step of performing a non-virtual operation on the bus signal comprises constructing the block diagram including an operation block representing the non-virtual operation and connecting a representation of the bus signal in the block diagram to an input port of the operation block.
3. The method of claim 2, wherein an outlet of the operation block connects to a modified bus signal comprising a modified first data signal, where the modified first data signal represents an output of the non-virtual operation where the first data signal is an input to the non-virtual operation, and a modified second data signal, where the modified second data signal represents an output of the non-virtual operation where the first data signal is an input to the non-virtual operation.
4. The method of claim 2, wherein the step of performing a non-virtual operation represented by the operation block comprises solving the non-virtual operation using values represented by the first data signal and the second data signal as inputs to the non-virtual operation.
5. The method of claim 4, where the step of solving the non-virtual operation comprises the steps of converting the graphical model to executable computer readable instructions representing the graphical model and executing the computer readable instructions, wherein the computer readable instructions implement the functionality specified by the model.
6. The method of claim 1, further comprising the step of defining one or more physical attributes for the first data signal and the second data signal of the bus signal.

7. The method of claim 2, wherein the bus signal has a structure that is the same at an output port of the operation block as at an input port of the operation block.
8. The method of claim 1, wherein the non-virtual operation comprises one of multiplication, division, integration, derivation, a linear transfer function, a delay function, a transfer function specified in terms of poles and zeros, a dead zone function, a switching function, a quantizing function and a rate limiting function on values represented by the first data signal and the second data signal.
9. The method of claim 1, wherein the first signal type and the second signal type are different.
10. The method of claim 1, further comprising the step of validating a constraint on the bus signal.
11. In an electronic device, a method comprising the steps of:
  - providing a definition for a bus signal; and
  - combining a first data signal with a second data signal in a graphical model displayed on a graphical user interface to form the bus signal having a structure defined by the definition.
12. The method of claim 11, further comprising the step of generating computer readable instructions corresponding to the definition of the bus signal.
13. The method of claim 11, wherein the step of providing a definition to the bus signal comprises entering a physical attribute for one of said first data signal and said second data signal via a graphical user interface.
14. The method of claim 11, wherein the step of providing a definition comprises defining a complexity of one of said first data signal and said second data signal.
15. The method of claim 11, wherein the step of providing a definition comprises defining a data type for an attribute of one of said first data signal and said second data signal.

16. The method of claim 11, wherein the step of providing a definition comprises defining a dimension of one of said first data signal and said second data signal.
17. The method of claim 11, wherein the step of providing a definition comprises defining a size of one of said first data signal and said second data signal.
18. The method of claim 11, wherein the step of providing a definition comprises defining a sample rate for the bus signal.
19. The method of claim 11, wherein the step of defining provides a complete definition for the bus signal.
20. The method of claim 11, wherein the step of defining provides a partial definition for the bus signal.
21. The method of claim 11, further comprising the step of specifying an implementation of the bus signal in computer readable instructions.
22. The method of claim 21, wherein the bus signal is represented in the computer readable instructions as one of: a structure passed by reference, a global structure referenced statically as global, a representation wherein element of the bus signal is an individual piece of unstructured data and a representation wherein individual bus elements are passed as formal parameters.
23. The method of claim 11, further comprising the steps of automatically determining a representation of the bus signal in computer executable instructions corresponding to a graphical model implementing the bus signal and implementing the bus signal in the computer readable instructions in the determined representation.
24. The method of claim 11, further comprising the step of connecting the bus signal in the graphical model to a non-virtual block to represent a mathematical operation to be performed on values represented by the first data signal and the second data signal.

25. The method of claim 24, wherein the non-virtual block preserves the structure of the bus signal across the non-virtual block.
26. In an electronic device, a method comprising the steps of:  
entering a definition for a bus signal in a graphical user interface; and  
saving the definition for the bus signal in memory.
27. The method of claim 26, further comprising the step of constructing a graphical model representing a dynamic system that implements the bus signal.
28. The method of claim 27, wherein the definition is associated with the graphical model in memory.
29. The method of claim 27, wherein the definition of the bus signal is saved independently of the graphical model.
30. In an electronic device, a method comprising the steps of:  
defining a definition for a bus signal used in a graphical model displayed on a graphical user interface; and  
generating computer readable instructions corresponding to the bus signal.
31. In an electronic device, a method comprising the steps of:  
combining a first data signal and a second data signal together to form a bus signal in a graphical model displayed on a graphical user interface; and  
passing the bus signal from a first domain to a second domain in the graphical model.
32. In an electronic device, a medium holding computer-executable instructions for a method, comprising the steps of:  
grouping a first data signal of a first signal type and second data signal of a second signal type to form a bus signal in a graphical model displayed on a graphical user interface; and  
performing a non-virtual operation on the bus signal.

33. The medium of claim 32, wherein the graphical model is a block diagram, and the step of performing a non-virtual operation on the bus signal comprises:

a user constructing the block diagram including an operation block representing the non-virtual operation a graphical user interface and connecting a representation of the bus signal in the block diagram to an input port of the operation block.

34. The medium of claim 33, wherein the step of performing a non-virtual operation represented by the operation block comprises solving the non-virtual operation using values represented by the first data signal and the second data signal as inputs to the non-virtual operation.

35. The medium of claim 34, where the step of solving the non-virtual operation comprises the steps of:

converting the graphical model to executable computer readable instructions representing the graphical model; and

executing the computer readable instructions, wherein the computer readable instructions implement the functionality specified by the model.

36. The medium of claim 32, further comprising the step of defining a definition for the bus signal.

37. The medium of claim 32, further comprising the step of validating a constraint on the bus signal.

38. In an electronic device, a medium holding computer-executable instructions for a method, comprising the steps of:

a user entering a definition for a bus signal; and

combining a first data signal with a second data signal in a graphical model displayed on a graphical user interface to form the bus signal having a structure defined by the definition.

39. The medium of claim 38, further comprising the step of generating computer readable instructions corresponding to the definition of the bus signal.

40. The medium of claim 38, further comprising the steps of determining a representation of the bus signal in computer executable instructions corresponding to a graphical model implementing the bus signal and implementing the bus signal in the computer readable instructions in the representation.

41. In an electronic device, a medium holding computer-executable instructions for a method, comprising the steps of:

a user entering a definition for a bus signal in a graphical user interface; and  
saving the definition for the bus signal in memory.

42. A system for generating and displaying a modeling application for simulating a dynamic system, comprising:

user-operable input means for inputting data to the application;  
a display device for displaying a graphical model representing the dynamic system;

and

an electronic device including memory for storing computer program instructions and data, and a processor for executing the stored computer program instructions, the computer program instructions including instructions for performing a non-virtual operation on a bus signal displayed in the graphical model, wherein the bus signal comprises first data signal of a first signal type and second data signal of a second signal type grouped together to form the bus signal.

43. A system for generating and displaying a modeling application for simulating a dynamic system, comprising:

user-operable input means for inputting data to the application;  
a display device for displaying a graphical model representing the dynamic system;

and

an electronic device including memory for storing computer program instructions and data, and a processor for executing the stored computer program instructions, the computer program instructions including instructions forming a bus signal having a structure defined by a definition entered by the user using the user-operable input means, by combining a first data signal with a second data signal in the graphical model displayed on a graphical user interface to form the bus signal.

44. A system for generating and displaying a modeling application for simulating a dynamic system, comprising:

user-operable input means for inputting data to the application;

a display device for displaying a graphical model representing the dynamic system;

and

an electronic device including memory for storing computer program instructions and data, and a processor for executing the stored computer program instructions, the computer program instructions including instructions receiving a definition for a bus signal from a user via the user-operable input means, and saving the definition for the bus signal in memory.